

A new orophilous species of the genus *Dasylobus* (Opiliones: Phalangiidae) from Sierra Nevada, Spain

Rocío Martín and Carlos E. Prieto¹: Laboratorio de Aracnología y Malacología, Departamento de Zoología y Biología Celular, Universidad del País Vasco, Apdo. 644 48080-Bilbao, Spain

Abstract. A new species, *Dasylobus nevadensis*, is described; it inhabits high areas of the Sierra Nevada, the highest mountain chain in Spanish mainland. The new species is smaller than all other Iberian *Dasylobus* species and has short, annulated legs, light silver coloration, and is juvenile-like. Together with *Roeweritta carpentieri* (Roewer 1953), this is an orophilous endemic species from Sierra Nevada.

Keywords: Iberian Peninsula, Phalangiinae, new species, taxonomy, Europe

The subfamily Phalangiinae comprises around 25 genera within the Holarctic region, with high representation in tropical Africa (Martens 1978; Staręga 1984; Crawford 1992). In the western Mediterranean area, the subfamily is represented by only three genera (Staręga 1984), *Phalangium* Linnaeus 1758, *Metaphalangium* Roewer 1911, and *Dasylobus* Simon 1878, as well as four endemic Macaronesian genera, *Bunochelis* Roewer 1923, *Metadasylobus* Roewer 1911, and *Parascleropilio* Rambla 1975 from the Canary Islands, and *Ramblinus* Staręga 1984 from Madeira Island.

The genus *Dasylobus* is characterized by a unidentate supracheliceral lamina, a basichelicerite with a dorsal granulated mound, a palpal patella with a mesal, conical/rounded, hairy apophysis, medium to long legs with an incrassate leg I, and a penis with a broad basis, slender trunk and wedge-shaped glans, and sometimes with dorsodistal spoon (Staręga 1976; Martens 1978). Additionally, it has a denticulate carapace, frontal corners and, sometimes, a saddle with a median lighter broad band.

In the Iberian Peninsula the genus is represented by several species, although the status of some of them is not very clear. *Dasylobus echinifrons* Simon 1879 was described from Narbonne, La Clape and Le Vernet (France) although Simon (1879) also reported it from Aranjuez and Sierra Morena (Spain). The known range of *D. graniferus* (Canestrini 1871), extends from Yugoslavia, Austria, Switzerland, Italy and France to Spain (Chemini 1989), where it was reported as *Eudasylobus nicaensis* (Thorell 1876) from Toledo (Roewer 1923), a synonym of *D. graniferus* according to Chemini (1986), and several sites from Sierra de Guadarrama (Simon 1879; Rambla 1967; Martens 1978). *Dentizacheus ibericus* Rambla 1968 was described from Torre de Moncorvo (Portugal) and transferred to *Dasylobus* by Prieto (2003).

Three other nominal species have been removed from *Dasylobus*: *D. lusitanicus* Roewer 1956, which was described from Coimbra (Portugal) but Staręga (2004) redescribed it as *Metaphalangium lusitanicum*, and *Eudasylobus rondaensis* Kraus 1959, described from Sierra del Oreganal near Ronda (Málaga) and localities in Tarragona (Sierra de Monsech) and Murcia (Sierra Espuña), which was transferred to *Dasylobus* by Prieto (2003) and synonymized with *M. lusitanicum* by Staręga (2004). The third nominal species, *De. zuluetai* Rambla 1959, described from El Escorial (Madrid), was synonymized with *Da. echinifrons* by Staręga (1973) who later (Staręga 2004) placed it in the synonymy of *M. lusitanicum*.

The Sierra Nevada (Fig. 1), located in Andalusia between Granada and Almería provinces, is the highest mountain range on the Iberian Peninsula, reaching 3,478 m in the Mulhacen and 3,395 m in the Veleta. The chain was formed during the Alpine Orogeny, following the collision between African and European plates, and the central massif is mainly composed of heavily deformed metamorphic rocks, mainly mica schists, locally with gneiss, quartzite and amphibolite (López-Bermúdez et al. 1989). The highest part of the range is included in the Sierra Nevada National Park.

Opilionological knowledge about the Sierra Nevada is very scarce because only two species have been previously recorded: *Homalenotus coriaceus* (Simon 1879) recorded by Kraus (1961) from Río Monachil (30SVG60, 2,300 m) and *Roeweritta carpentieri* (Roewer 1953), an endemic monotypic genus recorded from six localities between 2,000 and 3,000 m (Rambla 1960; Marcellino 1967; Barea 2008). During a trip to the region in November 1982, we found many small harvestmen under schistose stones. We routinely considered these specimens as juveniles during sorting, but on close inspection determined that they are adults belonging to an undescribed species, which is described here.

METHODS

Taxonomic methods follow outlines proposed by Pinto-da-Rocha et al. (2007). Body (carapace) width was measured between the incisions of coxae II and III. BLI index is the relation of the femur I length to the carapace width. All measurements are in mm.

Specimens were studied, photographed and drawn with a Nikon SMZ-1500 stereomicroscope provided with a drawing tube and a digital camera. The penis and spermathecae were drawn with a Nikon Optiphot. Photo stacks were combined with the software Helicon Focus, and backgrounds were cleaned with Photoshop.

The specimens studied in this contribution are lodged in the Museo Nacional de Ciencias Naturales, Madrid (MNCN) (holotype and female paratype) and the Departamento de Zoología y Biología Celular, Universidad del País Vasco, Bilbao (ZUPV) (remaining paratypes).

TAXONOMY

Family Phalangiidae Latreille 1802

Genus *Dasylobus* Simon 1878

Dasylobus Simon 1878:ccxviii (footnote).

¹Corresponding author. E-mail: carlos_prieto@ehu.es



Figure 1.—Known localities of Iberian *Dasylobus* species and *Metaphalangium lusitanicum*. E, *D. echinifrons* (*, locality of the synonym *Dentizacheus zuluetai*); G, *D. graniferus*; I, *D. ibericus*; N, *D. nevadensis* new species; L, *M. lusitanicum* (*, localities of the synonym *Eudasylobus rondaensis*). Right bottom inset, western part of Sierra Nevada National Park with the type locality of *D. nevadensis* new species (white dot).

Eudasylobus Roewer 1911:53. Synonymized by Chemini (1989).

Euplatybanus Roewer 1912:252. Synonymized with *Eudasylobus* by Starega (1984).

Parazacheus Lerma 1952:7. Implicitly synonymized with *Dasylobus* by Chemini (1989).

Type species.—*Opilio argentatus* Canestrini 1871 by original designation.

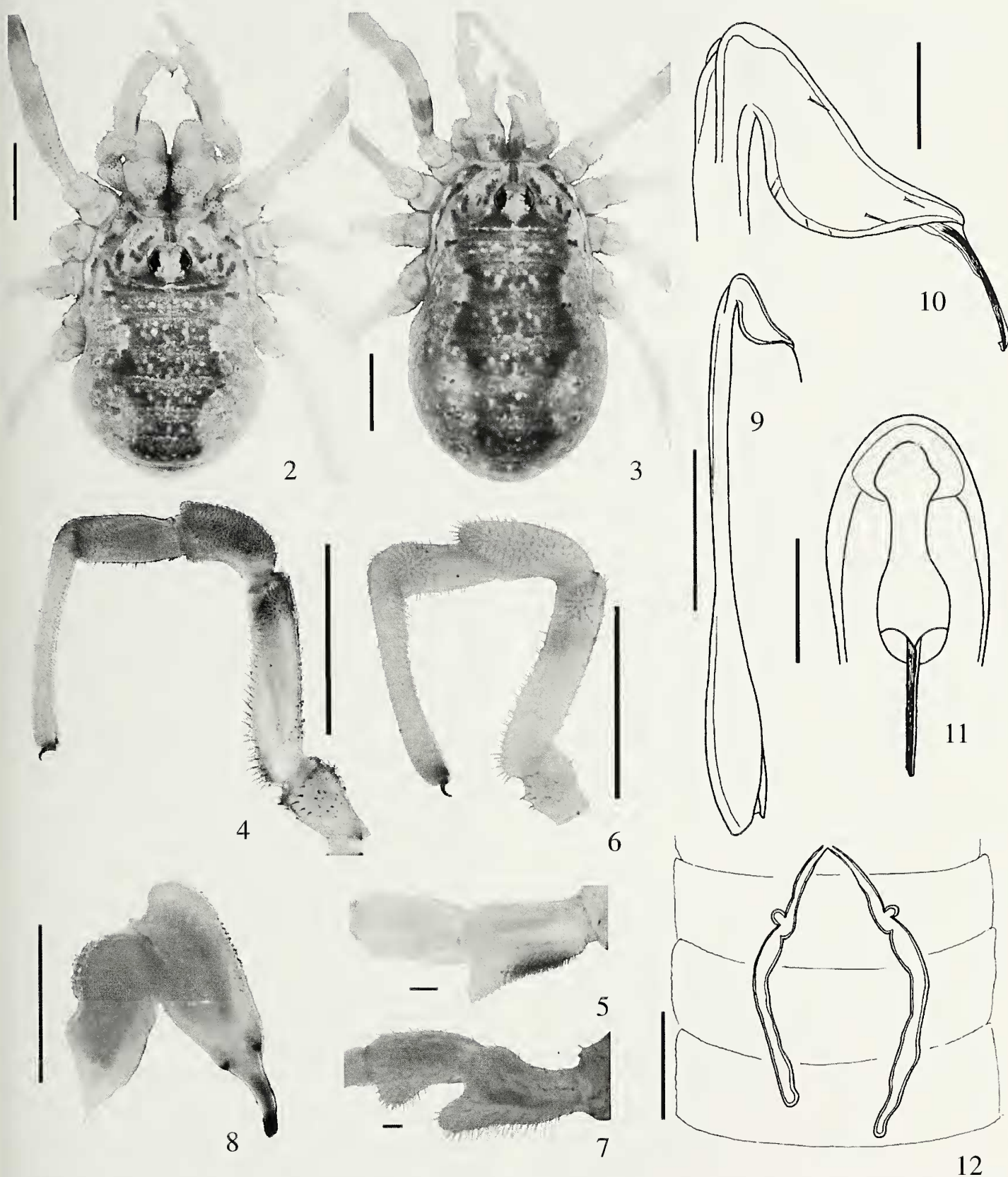
Diagnosis.—Penis shaft continuously narrowed from the basal to the middle part, thence distad almost parallel or little divergent edges, and moderately compressed dorsoventrally. Glans strongly compressed, swollen underneath and plain above. Palp femur smooth, patella with a mesodistal, short, blunt conical apophysis, tibia and tarsus smooth and hairy. Ocularium small, separated by half of its length from the frontal border. Supracheliceral laminae with a pointed granule on each (Martens 1978:290–291 for *Eudasylobus*).

Remarks.—Chemini (1989) reviewed the Italian taxa, concluding that only four species occur in Italy, but the remaining species are poorly known. According to Hallan &

Kury (2009), the genus comprises about 20 species distributed within the Mediterranean region, from Asia Minor and Lebanon to Algeria and the Iberian Peninsula, including the larger islands (Cyprus, Crete, Sardinia, Corsica, Balearic), but some entries are doubtful or have been removed recently to synonymy. The Spanish fauna is currently composed of four taxa (Starega 2004; Prieto 2008); *D. echinifrons* (Simon 1879), *D. graniferus* (Canestrini 1871) and *D. ibericus* (Rambla 1968) from the Spanish mainland, and *D. ferrugineus* (Thorell 1876) from Balearic Islands.

Dasylobus nevadensis new species (Figs. 2–12)

Type material.—SPAIN: *Granada*: holotype male, Sierra Nevada: road to the Veleta peak (UTM [WGS84]: 30SVG658050), 2,560 m, under stones in a stony slope, 2 November 1982, C.E. Prieto and A. Prieto (MNCN 20.02/17103). Paratypes: 9 males, 11 females, 1 juvenile, same data as holotype (ZUPV/0258bis); 1 female, same data as holotype (MNCN 20.02/17104).



Figures 2-12.—*Dasylobus nevadensis* new species: 2. Male holotype, dorsal view; 3. Female, dorsal view; 4. Male palp, internal view; 5. Male palp tibia and patella, dorsal view; 6. Female palp, internal view; 7. Female palp tibia and patella, dorsal view; 8. Male chelicerae, lateral view; 9. Penis, lateral view; 10. Glans, lateral view; 11. Glans, frontal view; 12. Spermathecae in female ovipositor. Scale bars = 1 mm (Figs. 2-4, 6, 8), 0.5 mm (Fig. 9), 0.1 mm (Figs. 5, 7, 10-12). Figs. 3-12 from male and female paratypes.

Table 1.—Leg measurements and tarsal counts of the male holotype and a female paratype of *Dasylobus nevadensis*.

		Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total leg	No.tarsomeres
Male	Leg I	0.32	2.04	0.78	1.90	2.20	3.80	11.04	26
	Leg II	0.38	3.57	1.00	3.15	3.29	7.03	18.42	45
	Leg III	0.27	2.13	0.80	1.82	2.63	4.16	11.81	29
	Leg IV	0.37	2.92	0.83	2.38	3.68	5.52	15.70	32
Female	Leg I	0.29	1.65	0.70	1.50	1.75	3.01	8.9	27
	Leg II	0.37	3.14	0.92	2.77	2.85	5.86	15.91	43
	Leg III	0.29	1.79	0.66	1.55	2.05	3.36	9.70	27
	Leg IV	0.32	2.61	0.74	2.05	3.05	4.39	13.16	32

Etymology.—The specific epithet refers to the Sierra Nevada, the highest mountain chain on the Iberian Peninsula, which this species inhabits.

Diagnosis.—Belonging to the genus *Dasylobus*, this species can be recognized by its juvenile appearance, small size (3.0–3.9 mm in males and 3.5–4.5 mm in females), short (BLI index, 0.87–1.01 in males and 0.69–0.81 in females), clearly annulated legs, and palpal patella with a conical apophysis.

Description.—*Male holotype*: body length 3.76 mm, carapace width 2.26 mm, femur I 2.04 mm, BLI 0.90.

Carapace (Fig. 2): dorsum smooth except for some scattered denticles, mainly concentrated between ocularium and ozopores. Supracheliceral laminae with one denticle on each lamina. Frontal edge regularly concave, completely unarmed in the center and with tufts of strong denticles on each anterior corner. Ozopores visible from above and with 1–3 denticles near the anterior and posterior corners. Ocularium silver in color, except for dark ocular rings; medium-sized (1/4 of width and 1/3 of length of carapace) with a medial groove and a row of 7–8 denticles in each side around the eyes. Carapace divided by a ledge, parallel to lateral borders, in a central area and two lateral ones; lateral areas with a marginal silvery stripe and four brown patches; central area with two brown close parallel stripes on the preocular region, lateral sides with brown patches separated by silvery color and two triangular patches behind the ocularium. First and second thoracic tergites each with a row of small denticles.

Abdomen: cream ground color. Abdominal scutum smooth, but with several brown sclerotization spots. Dorsal saddle wide, brownish but spotted in white, extending from first thoracic tergite to area V, narrowed in areas I and IV, with area I lined with silvery stripes. Remainder of abdominal surface with brownish dots and whitish halos. Silvery anal operculum. Ventral side cream-colored. Leg coxae smooth and covered with numerous short setae, and fields of brown spots on posterior faces. Genital operculum with irregularly arranged short setae and 2 pairs of close brown spots basally. Posterior border of genital operculum indicated by a brownish 'M'-shaped patch. Abdominal sternites smooth, with scattered setae and rows of brown patches on anterior edges.

Chelicerae (Fig. 8): first segment short, thickened, and with a large dorsal protuberance with irregular surface, more elevated on internal side and covered by granules and scattered setae. Second segment with a dorsal domed protuberance with frontal side covered by granules and setae.

Palps (Figs. 4, 5): trochanter with some dorsal and ventral granules distally. Femur with a ventral field of setae and scarce granules, a basal mesodorsal granular field, a dorsal row of

setae and few denticles, and a small distomesal thickening covered by setae. Patella with a distomesal conical apophysis, mesal side densely covered by a setose field, which continues to the apophysis. Tibia with a very small setose distomesal swelling. Tarsus densely covered by setae, mesal side with two inconspicuous rows of microgranules. Femur to tibia each with a dorsal light brown stripe.

Legs: relatively short (BLI = 0.90). Femur, patella, and tibia of leg I thickened. Femur with a whitish basal ring (suture line for autotomy), rounded in transversal section and with five rows of setose granules (13–17 in femur I). Patella with rows of setae and 3 denticles on distodorsal edge. Tibia with 3 dorsal rows of setae and 2 ventral rows of sharp granules, and a small basodorsal denticle; spiracle located retrobasally. Metatarsus with some granules on ventral side and a pseudoarticulation at the distal third. Tarsus with many tarsomeres (26, 45, 28–29, 31–32 in legs I–IV, respectively). Legs brownish, with white annulations located as follows: femur with basal, central and apical rings; apical on patella; central and apical on tibia; basal and surrounding the pseudoarticulation on tarsus.

Penis (Figs. 9–11): 1.75 mm long. Shaft widened basally (0.3 mm), strongly tapering until half of its length (0.1 mm wide), then very gradually widened towards distal end (0.15 mm wide). End of shaft without dorsal excavation. Glans with triangular profile, and apically dilated in frontal view; stylus with a secondary internal point.

Female (Figs. 3, 6, 7): similar to male but abdomen wider and longer, and saddle less profiled. Chelicera normally developed. Palpal patella (Fig. 7) with a more developed apophysis and mesal side covered by longer setae; distomesal apophysis of the tibia more developed and covered by longer setae.

Spermathecae (Fig. 12): long and slender, bent toward the ovipositor axis and extended until the third complete ring, with a small secondary pouch on the first third of its length.

Measurements: see Tables 1 and 2.

Remarks.—The new species has male chelicerae with a large dorsal protuberance on the basal article, palp with a conspicuous distomesal apophysis on the patella and another apophysis on the tibia (much smaller in the male), femur I thickened, anterior corners of the carapace with tufts of strong denticles, and supracheliceral laminae with a denticle on each. These features indicate that the species belongs to the genus *Dasylobus*.

Dasylobus nevadensis is easily distinguished from the other Iberian species. *Dasylobus ibericus* and *D. echinifrons* are bigger (body size 6 mm or larger) and robust, with longer and

Table 2.—Average range size and standard deviation of body, legs, and BLI index of male and females adults of *Dasylobus nevadensis*. Width is the distance between the incisions of coxae II and III. BLI index is the relation of the femur I length to the carapace width.

	Length	Width	Femur I	Leg I	Leg II	Leg III	Leg IV	BLI
Males (<i>n</i> = 9)								
Average	3.49	2.04	1.89	10.18	17.48	11.16	14.61	0.92
Minimum	3.06	1.85	1.62	8.73	14.43	9.24	12.47	0.87
Maximum	3.90	2.26	2.09	11.19	18.55	12.68	15.7	1.01
Standard dev.	0.29	0.14	0.15	0.75	1.59	1.15	1.05	0.04
Females (<i>n</i> = 12)								
Average	4.10	2.15	1.60	8.98	15.74	9.72	13.00	0.75
Minimum	3.50	2.00	1.50	8.52	17.01	9.13	12.44	0.69
Maximum	4.52	2.24	1.67	9.51	9.65	10.67	13.89	0.82
Standard dev.	0.30	0.09	0.05	0.28	0.59	0.41	0.51	0.03

non-annulated legs (Simon 1879; Rambla 1968). *Dasylobus graniferus* is distinguished by the presence of a conspicuous protuberance above the articulation of cheliceral fingers on the second cheliceral segment of the male (Rambla 1967; Martens 1978; Chemini 1989).

Metaphalangium lusitanicum, formerly in *Dasylobus*, has some features in common with *Dasylobus*, but has a short and wide distal apophysis on the palpal patella, longer legs, denticle rows on the ocularium with only 4–5 denticles, basal segment of male chelicerae without dorsal denticulate bump, and lacks a distal apophysis on the palpal tibia.

Another piece of data that partly justifies the specific separation is the date of collection of the specimens; adults of *Metaphalangium lusitanicum* were collected in March and April (Kraus 1959, as *Eudasylobus rondaensis*), while the specimens of *Dasylobus nevadensis* were gathered in November, which implies different life cycles for both species.

Curtis & Machado (2007) review the temporal patterns in harvestmen, and Rambla (1985) and Tsurusaki (2003) discuss phenological patterns for several northern or montane species. Most montane and alpine species show hatching and growth in late spring/summer, and maturation and egg-laying in late summer/autumn, and finally hibernating over winter in the egg stage. *Dasylobus nevadensis* may match that life cycle; in fact, it matches the cycle of *Harmanda nigrolineata* Martens 1987, which occurs in the Himalayan Mountains between 2,400 and 3,500 m (Curtis & Machado 2007, based on data from Martens 1984). According to an ombrotermic diagram for an Astronomic Observatory from the Sierra Nevada at 2,507 m and less than a kilometer from the type locality (Rivas-Martínez et al. 1997), there is a long period between November and April when the temperature is below 0 °C and the terrain is usually fully covered with snow that has fallen during autumn and winter. Therefore, as we stated earlier, this species would hatch, grow, and mature between May and October–November.

On the contrary, only a few harvestmen with distributions throughout southern/xeric regions have been studied. *Trachyrhinus marmoratus* Banks 1894 from the arid regions of Texas is a good example, with the adult stage between January and July, with abundance peak in April (Curtis & Machado 2007). Another more relevant example is *D. graniferus* from southern Italy (Chemini 1989); all data for localities in Calabria and Sicily lie between May and early July. *Metaphalangium lusitanicum* matches this southern life cycle,

with hatching and growth occurring in winter, and maturation and egg-laying in spring, due to the strong and longer xeric season of summer/autumn, as the phenological profile of *Opilio insulae* Roewer 1956 in lower elevations in Crete (Chatzaki et al. 2009), a species with a high phenological plasticity because it lives also at 2,000 m, where the snow cover lasts generally from November to May, matching the phenological profile of *Dasylobus nevadensis*.

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